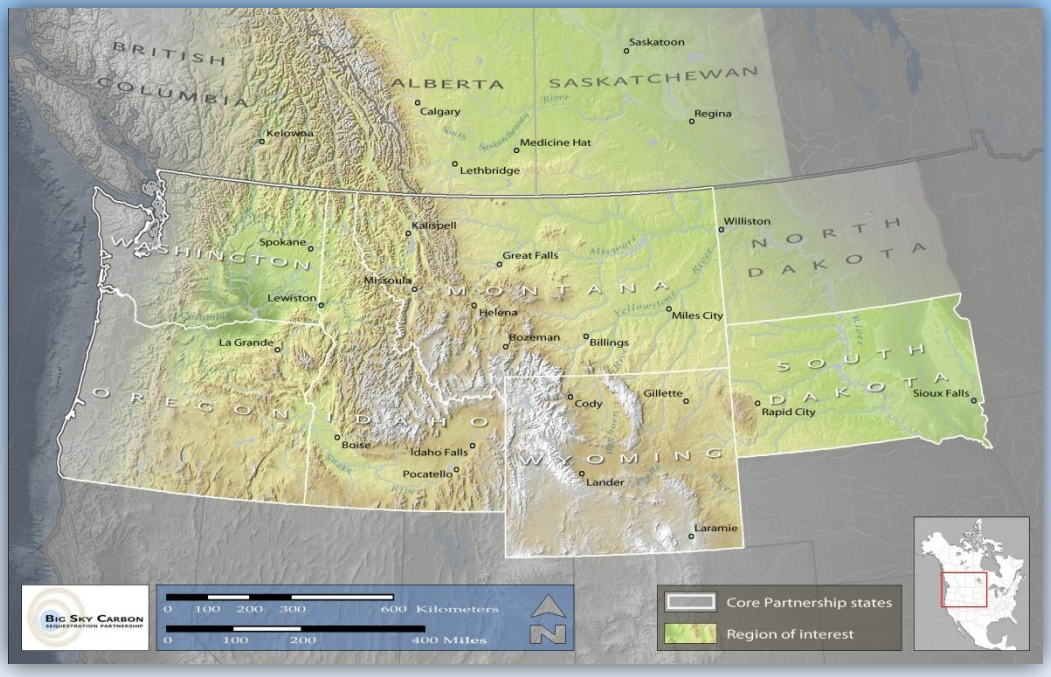
Big Sky Carbon Sequestration Partnership



John Talbott
Deputy Director and Program Manager

Western Interstate Energy Board Annual Meeting
April 1, 2008

BIG SKY CARBON SEQUESTRATION PARTNERSHIP

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Outline

- Big Sky Carbon Sequestration Partnership
- Phase II Geologic Activities
- Phase II Terrestrial Activities
- Phase III Large scale Demonstration Project

Project Elements - BSCSP Partners

Battelle
Boise State University
Bullivant Houser Bailey PC
Center for Advanced Energy Studies
Center of Energy & Economic Development
Cimarex Energy
Columbia University, Lamont-Doherty Earth Observatory
Crow Tribe
Det Kongelice Olje OgEnergidepartment
Edison Mission Group
Energy Northwest
EnTech Strategies, LLC
Environmental Financial Products
Environmental Protection Agency
Heller/Ehrman
IBM
Idaho Carbon Sequestration Advisory Committee
Idaho Dept. of Environmental Quality
Idaho National Laboratory
Idaho Soil Conservation Service
Idaho State University
Inland Northwest Research Alliance
Institute for Energy Technology (Norway)
Institute de Physique de Globe de Paris
Inter Tribal Timber Council
Jackson Hole Center for Global Affairs
Los Alamos National Laboratory
Montana Bureau of Mines and Geology
Montana Dept. of Environmental Quality
Montana Farm Bureau Federation
Montana GIS Services Bureau IT Services
Montana Governor's Office
Montana State University - Bozeman
Montana Tech
National Carbon Offset Coalition
National Geophysical Research Institute (India)
National Tribal Environmental Council
Nez Perce Tribal Council
Norwegian University of Science and Technology
Oregon State University
PacifiCorp
Portland General Electric (PGE)
Power Procurement Group
PPL Montana
Puget Sound Energy (PSE)
Ramgen Power Systems, Inc.
Research Council of Norway
Ruckelshaus Institute of Environment & Natural Resources
Russian Academy of Sciences
Sage Resources
Schulmberger
Semiarid Prairie Agricultural Research Center, Canada
Sintef Petroleum Research (Norway)
South Dakota School of Mines and Technology
Southern Montana Electric
State Geological Survey Units
Summit Energy
The Sampson Group
Unifield Engineering
United Power
University of Idaho
University of Wyoming GIS Center
University of Wyoming Enhanced Oil Recovery Institute
University of Idaho
Wageningen University (The Netherlands)
Western Governors' Association
Westmoreland Coal
Wyoming Carbon Sequestration Advisory Committee
Wyoming DEQ
Wyoming State Governor's Office
Yellowstone Ecological Research Center

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Phase II Activities (2005-2009)

Geologic

*Basalt Characterization
Enhanced Coalbed Methane
Naturally Occuring CO_2 study
Mafic Rock Atlas
Atlas and Interactive Mapping

Terrestrial

*Carbon Markets
*Terrestrial sequestration MMV

Economics

Geologic feasibility analysis
Terrestrial feasibility analysis

Outreach & Regulatory Compliance

Promote public awareness of CCS and BSCSP activities
Development of regulatory guidelines
Inform policy development

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Basalt Pilot Test

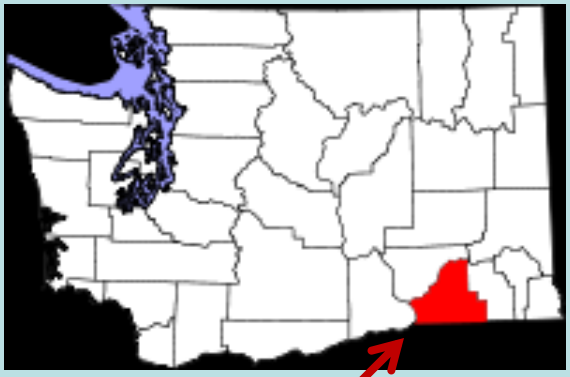
Project Goal

Conduct a small scale CO_2 sequestration project (3000 -5000 tons) in flood basalts to confirm the feasibility of permanently and safely sequestering large quantities of CO_2 in basalt formations.

Objectives

1. Determine capacity, injectivity and mineralization rates in deep basalts in a field setting
2. Address the critical technical issues of injection, fate and transport of CO_2 in interflow zones in a deep basalt formation
3. Participate in public outreach activities as required or as requested by industry partners
4. Work with state regulators and environmental NGO groups to ensure timely support of necessary permitting

Test location: ~16 miles south of Pasco, Washington in lightly inhabited agricultural and heavy industrial-zoned land in western Walla Walla County, Washington.



Walla Walla County

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Basalt Pilot Test Progress to date

- Field Work Plan completed – 12/07
- Industry partners committed - ongoing
- Laboratory experiments on reactivity of basalts - ongoing at Battelle - PNWD
- Public outreach and lab tours – ongoing (over a dozen events this year)
- Seismic Survey completed – 12/2007
- Soil and gas surveys are ongoing, began 08/2007
- Drilling injection wells scheduled for – 09/2008
- Injection scheduled for 11/2008 - 2 week injection
- MMV activities will be intensive for 3 months post injection & continue for 18-24 months

Monitoring and Verification of Carbon in Croplands, Rangelands and Forests

Objectives

- Quantify and determine management practices to optimize C sequestration
- Develop MMV protocols that can establish sequestration rates for different management practices
- Develop MMV protocols that reduce verification costs

Activities

- Soil Sampling and calibration
- MMV methodologies
- Planning Handbook

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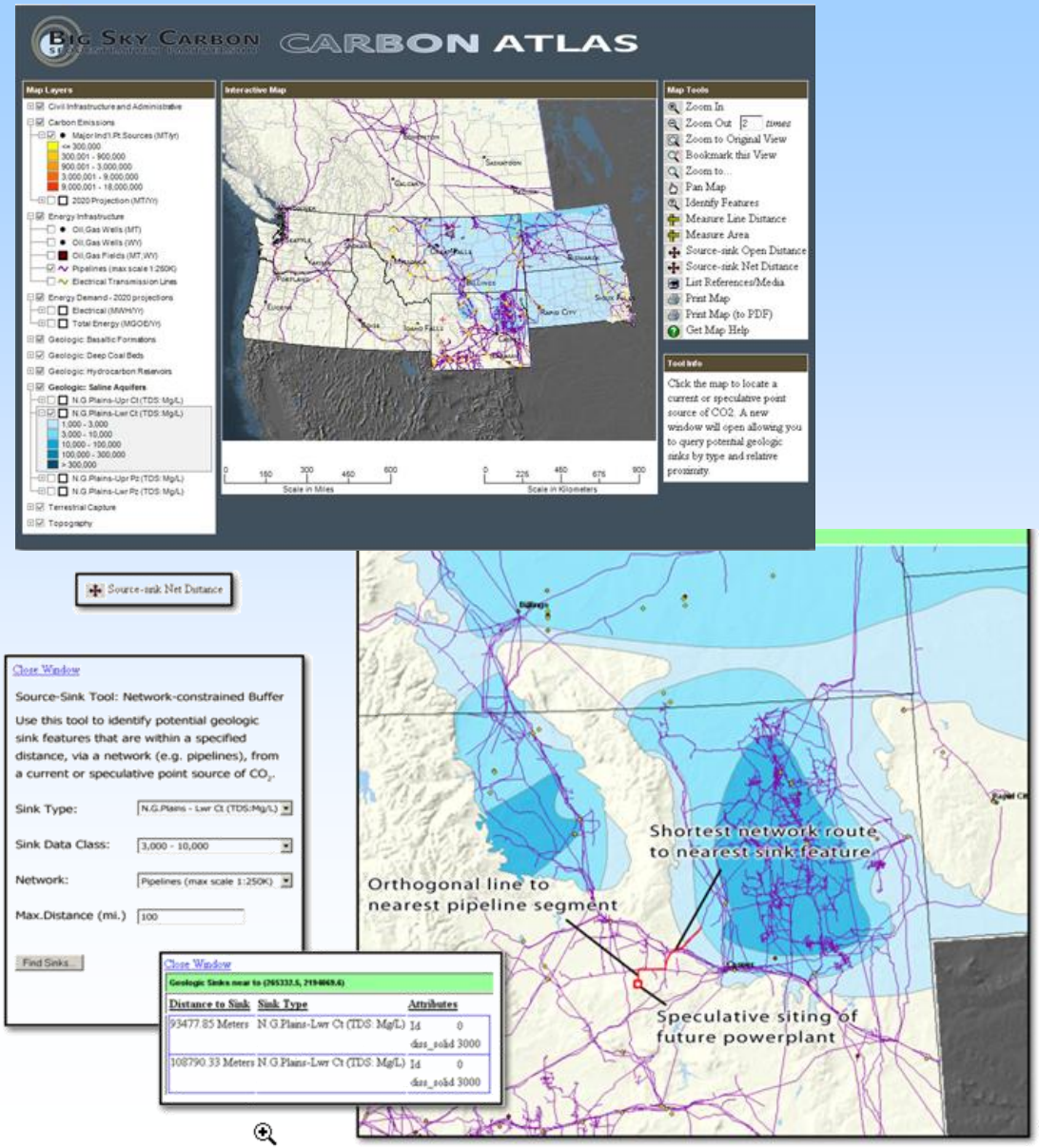
Interactive Map and Carbon Atlas

- Custom query tools for locating potential geologic sink features proximate to CO_2 point source(s)
- Calculation of source-to-sink distances – “as the crow flies”, or network-constrained
- Tool for retrieving technical references for areas of interest (e.g., sedimentary basins)
- Data download tool



Big Sky Carbon Sequestration Partnership

Public Outreach

- Big Sky Energy Future Coalition
- Annual Big Sky Energy Forum
- Big Sky Annual Energy Report
- State Legislative CCS Symposium
- Web site and materials
- National Outreach Working Group

Regulatory Compliance

- Regulatory and Public Involvement Action Plan
- Regulatory Permitting Guidelines
- Prepare and file regulatory permits required for field tests

Phase III Large Volume Demonstration Project

- **Project Goal:** Demonstrate long-term safe storage of CO_2 into a regionally significant geologic sink
- **Site Description:** Riley Ridge Unit on the LaBarge Platform in SW Wyoming
- **Injection Target:** Nugget sandstone saline aquifer at ~11,000 feet
- **Source of CO_2:** Plan to inject 1-2 million tons of CO_2 from Cimarex Energy plant
- **Partners:** University of Wyoming, Montana State University, Columbia University, LANL, LLNL, Cimarex Energy, and Schlumberger

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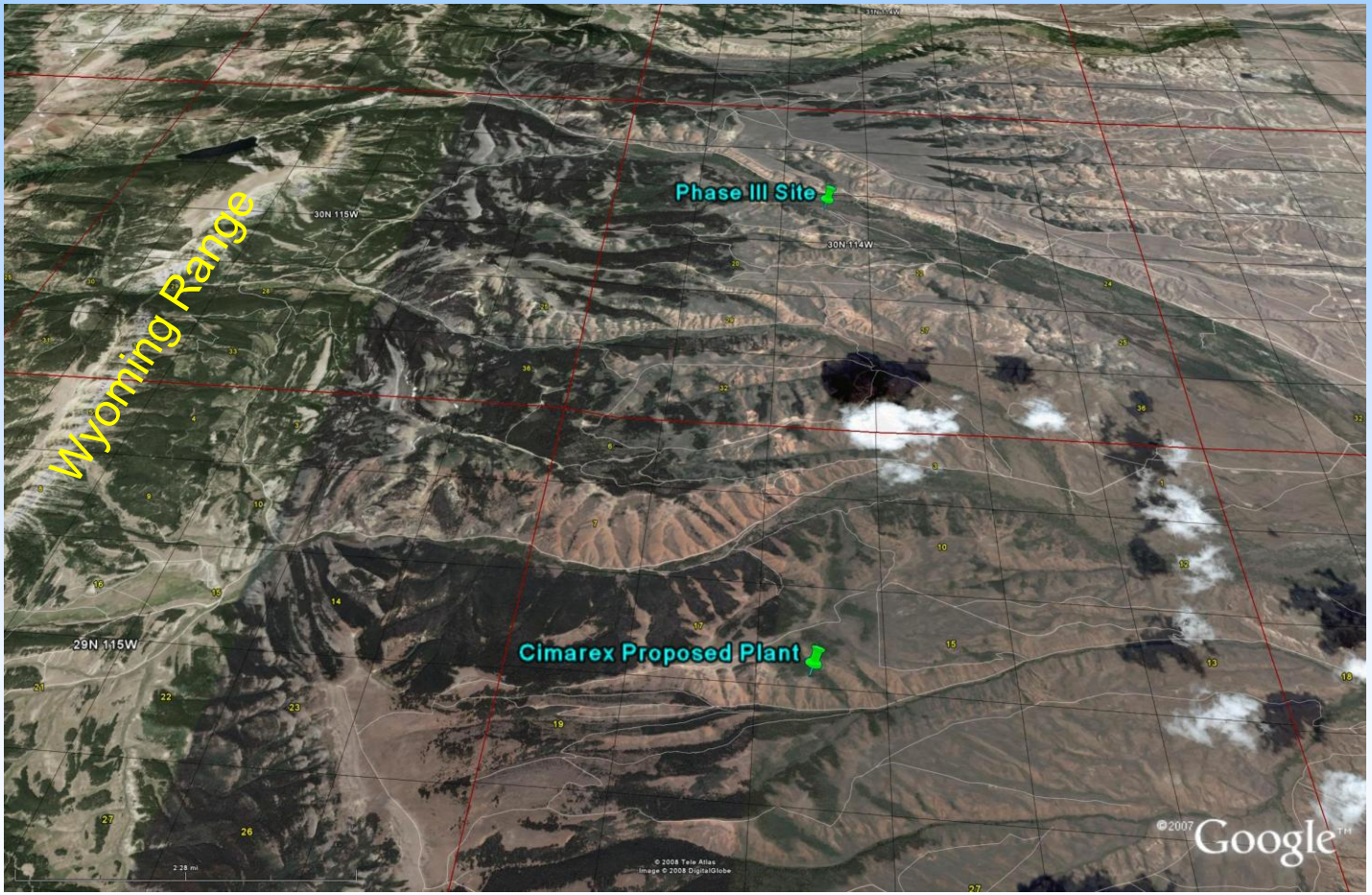
Proposed Project Site

- Cimarex Gas Plant on line in 2008 will produce and inject 75MMCFD of 92% CO_2 and 8% H_2S (3,947 tons of CO_2/day or 1.44 million tons/year)
- Drill a new injection well and monitoring wells to conduct test of Nugget saline aquifer
- Core from new wells will be used for analyses and flow testing



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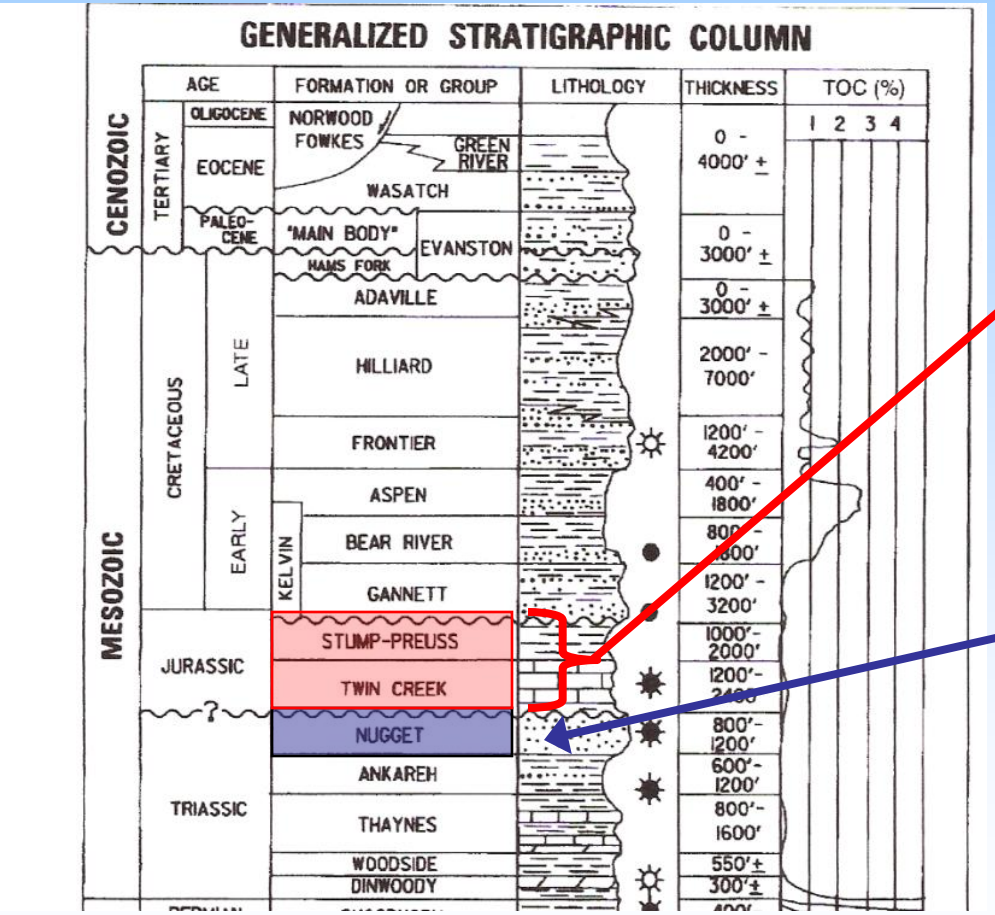
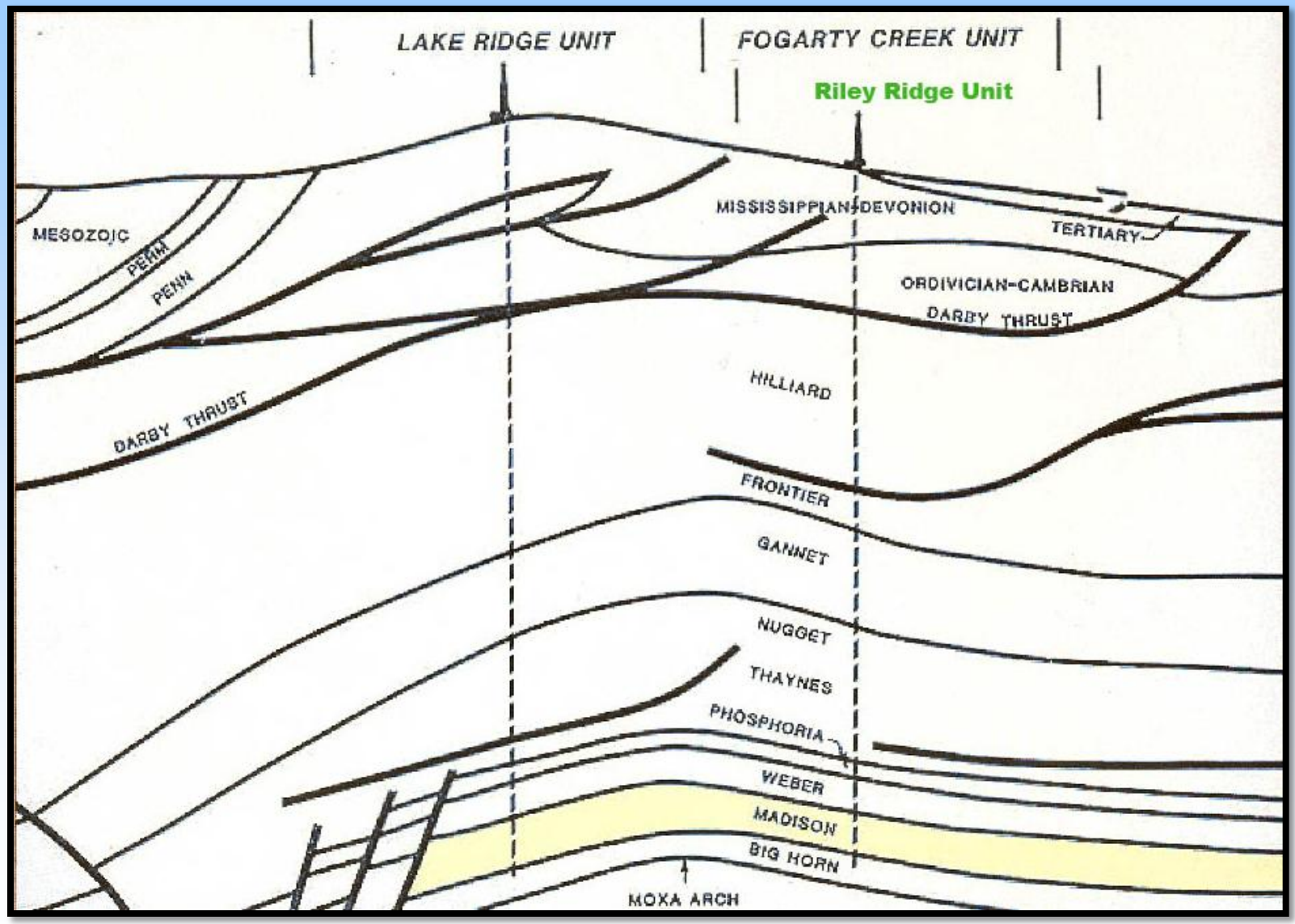
Southwest Wyoming Geology



Sealed by 75 feet of anhydrite and 2200-4400 feet of Twin Creek LS and Stump-Preuss Shale

Target - Nugget Sandstone
Saline Aquifer (100,000 TDS)
12% porosity, 70-300mD

LaBarge Field – West-East Cross Section



Phase III Large Volume Demonstration Project Timeline 2008-2016

The planned Key Project Dates are:

- Baseline work completed by the end of 2010
- Drilling operation begins by mid 2010
- Injection operation begins in 2011
- MMV Events occur from 2010-2016
- Injection Operations end in 2013-14
- Site Closure complete by 2016

Phase III Large Volume Demonstration Project Accomplishments to date:

- Significant progress has been made on project planning, design and operational management
- Identification of project site location, procurement of CO2, assessments of existing and needed infrastructure, compilation of relevant research to project, and regional geologic characterization that includes a preliminary static geologic model
- Agreements with major industry partners; Cimarex Energy and Schlumberger
- Geologic modeling and identification of appropriate MMV methodologies
- Letters of commitment have been received from all institutional partners

Questions?

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